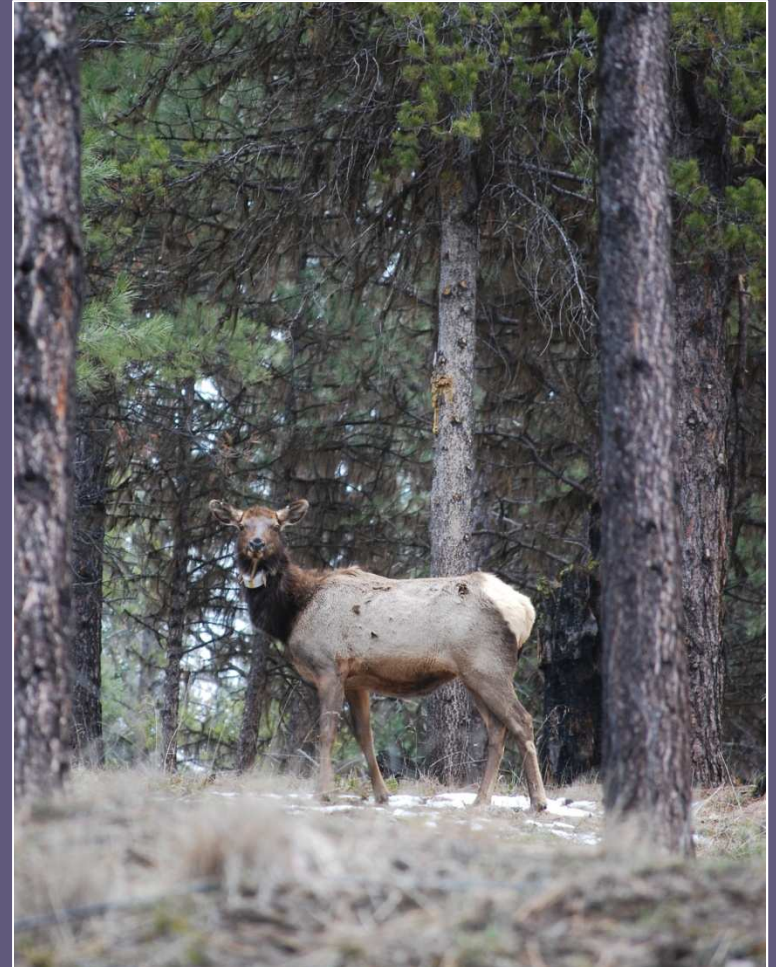


Risk Modeling for Brucellosis Transmission in Montana



Outline

- Elk – cattle transmission
- Elk – elk transmission
- *Brucella* environmental persistence



Elk to cattle transmission risk



- Predicting elk distributions is necessary to forecast wildlife and livestock spatial overlap and the potential for brucellosis transmission

Proffitt, KM, JA Gude, KL Hamlin, RA Garrott, JA Cunningham, and JL Grigg. 2011. Elk distribution and spatial overlap with livestock during the brucellosis transmission risk period. *Journal of Applied Ecology* 48:471-478.

Elk to cattle transmission risk

Project objectives

- Develop models predicting elk distributions during the risk period
- Determine model applicability across the GYE
- Integrate extrapolated resource selection function maps, elk counts, and domestic livestock distributions to forecast elk to livestock brucellosis transmission risk



Model development

- Used elk location data from 49 collared elk
- Madison Valley elk herd, 2005-2006



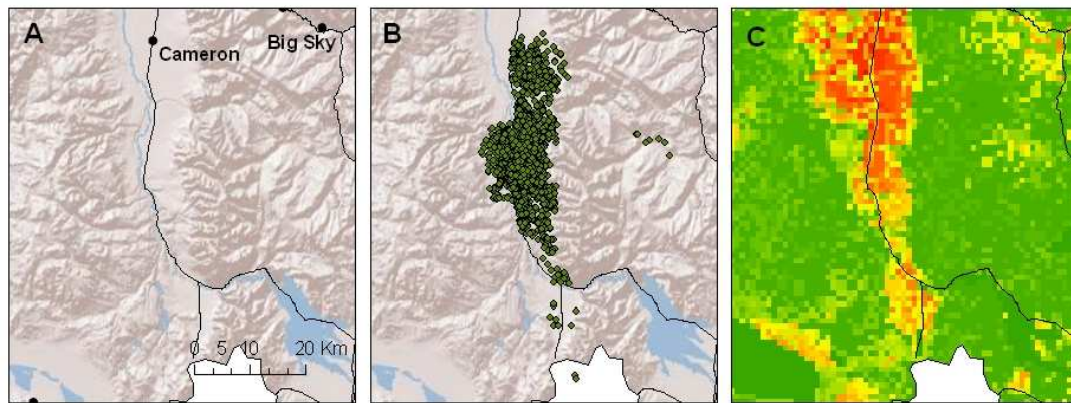
Model development



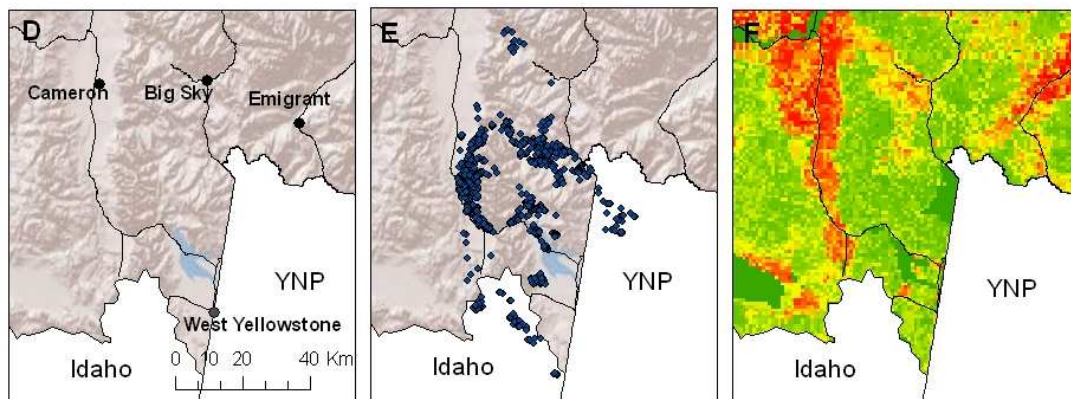
- Compared attributes of used locations to randomly generated available locations
 - Habitat type
 - Slope
 - Aspect
 - Elevation
 - Road density
 - Land ownership
 - Snowpack
 - NDVI
 - Wolf Risk

Predicted elk distributions

Abortion period



Calving period



**Predicted
elk distribution**

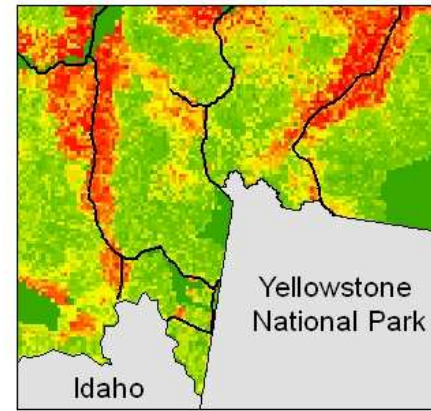
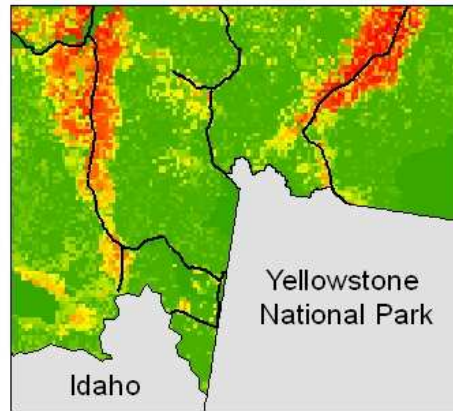
**Potential livestock
grazing area**

Transmission risk

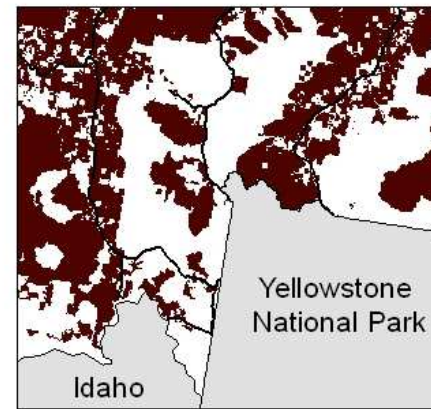
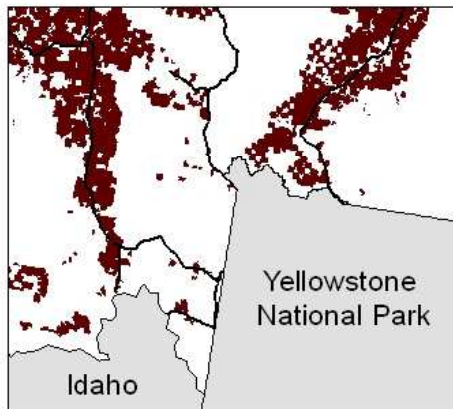
Abortion Period

Calving Period

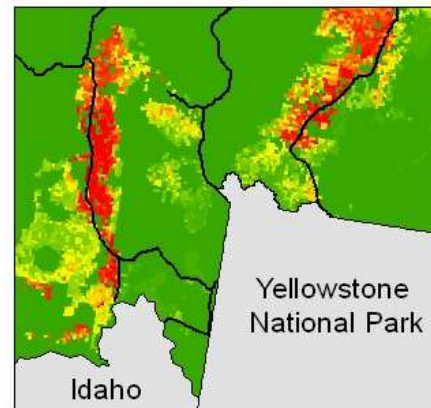
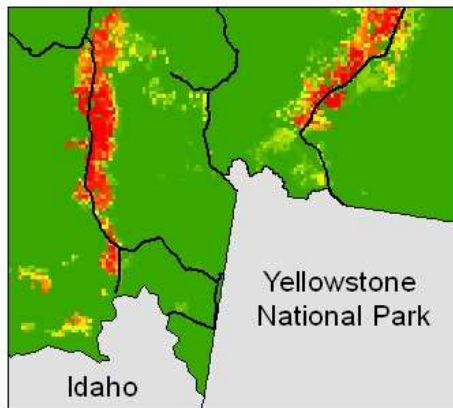
A



B

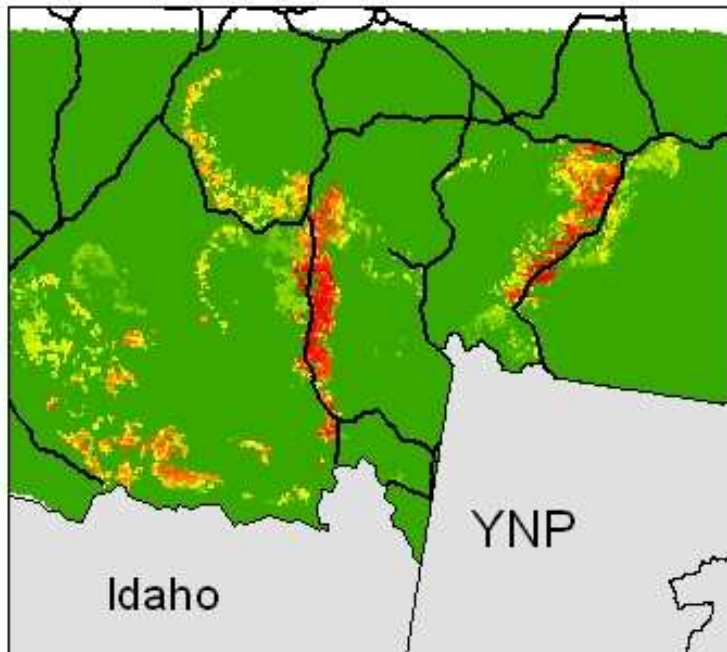


C

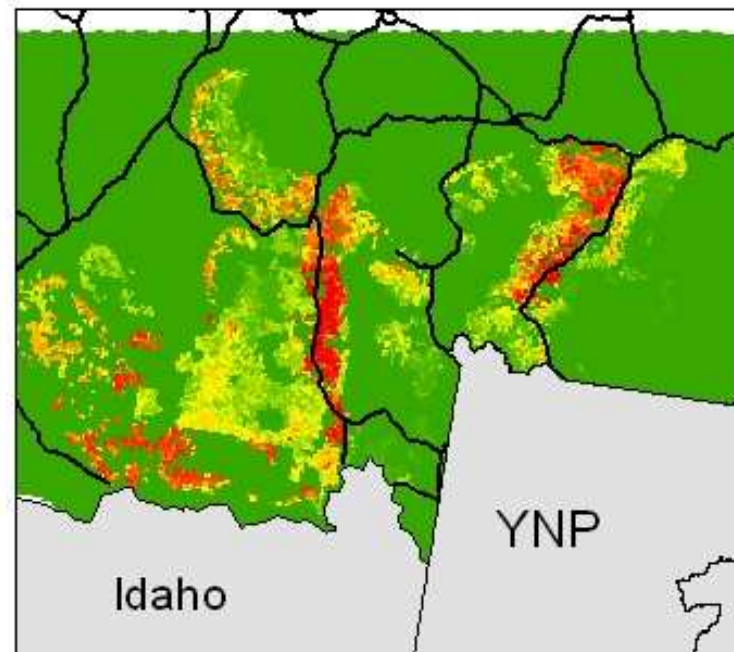


Transmission risk across the northern GYE

Abortion Period



Calving Period



Elk to cattle transmission risk

Conclusions

- Predictive accuracy of models relatively high
- This is a work in progress
- Predicted elk distributions may be used as a tool for focusing management actions aimed at minimizing elk and livestock spatial overlap

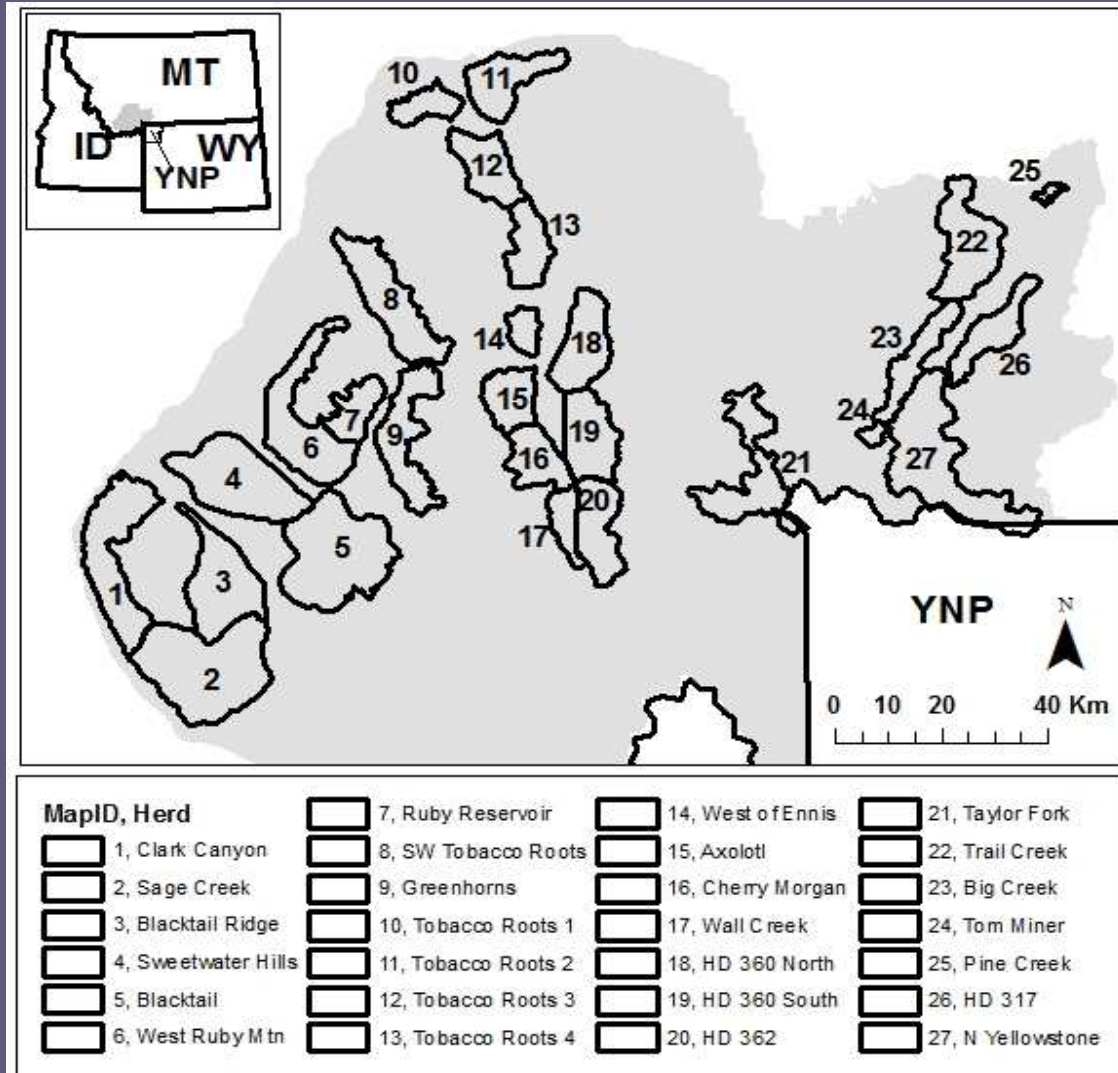


Elk to elk transmission risk

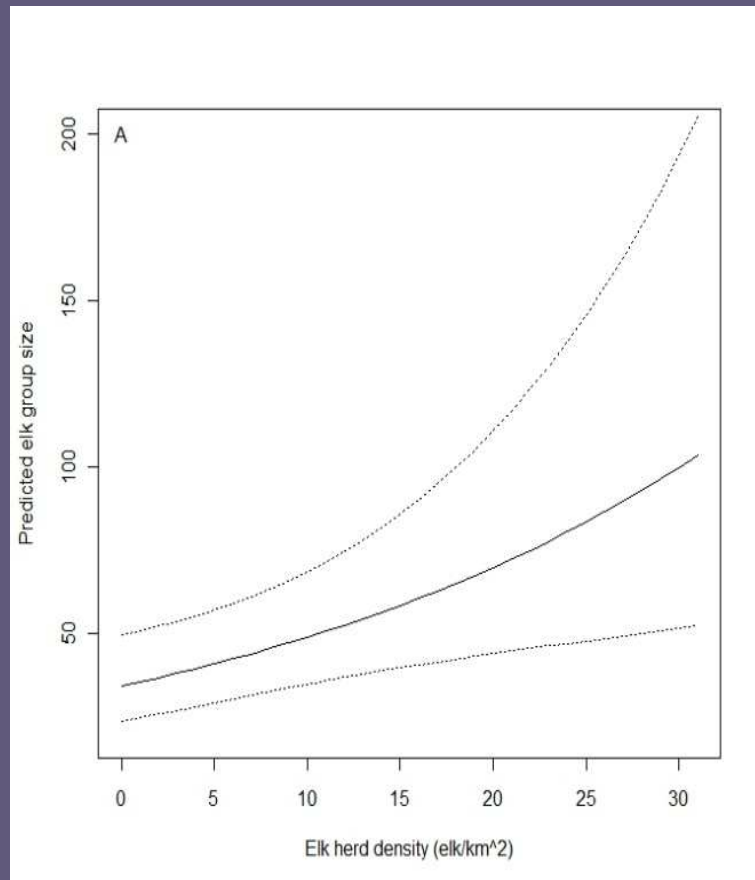


- Recent studies in Wyoming suggest increasing elk densities and aggregation sizes may result in free-ranging elk serving as maintenance hosts
- Found correlations between elk density and seroprevalence
- In MT, initiated a study to investigate spatial variations in elk density, aggregation patterns, and seroprevalence

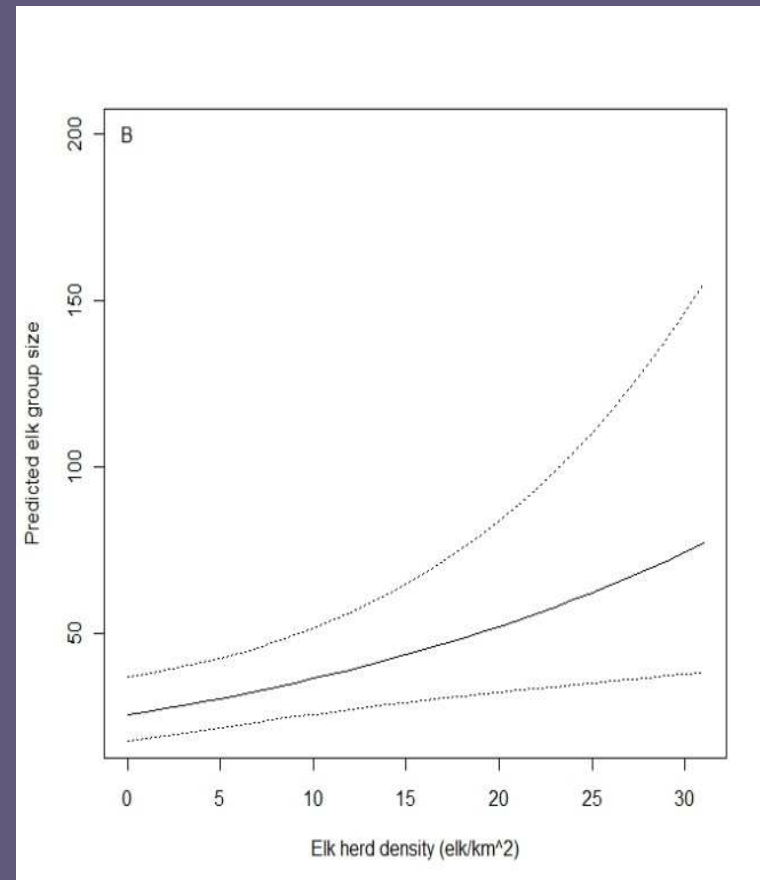
Elk to elk transmission risk



Elk to elk transmission risk

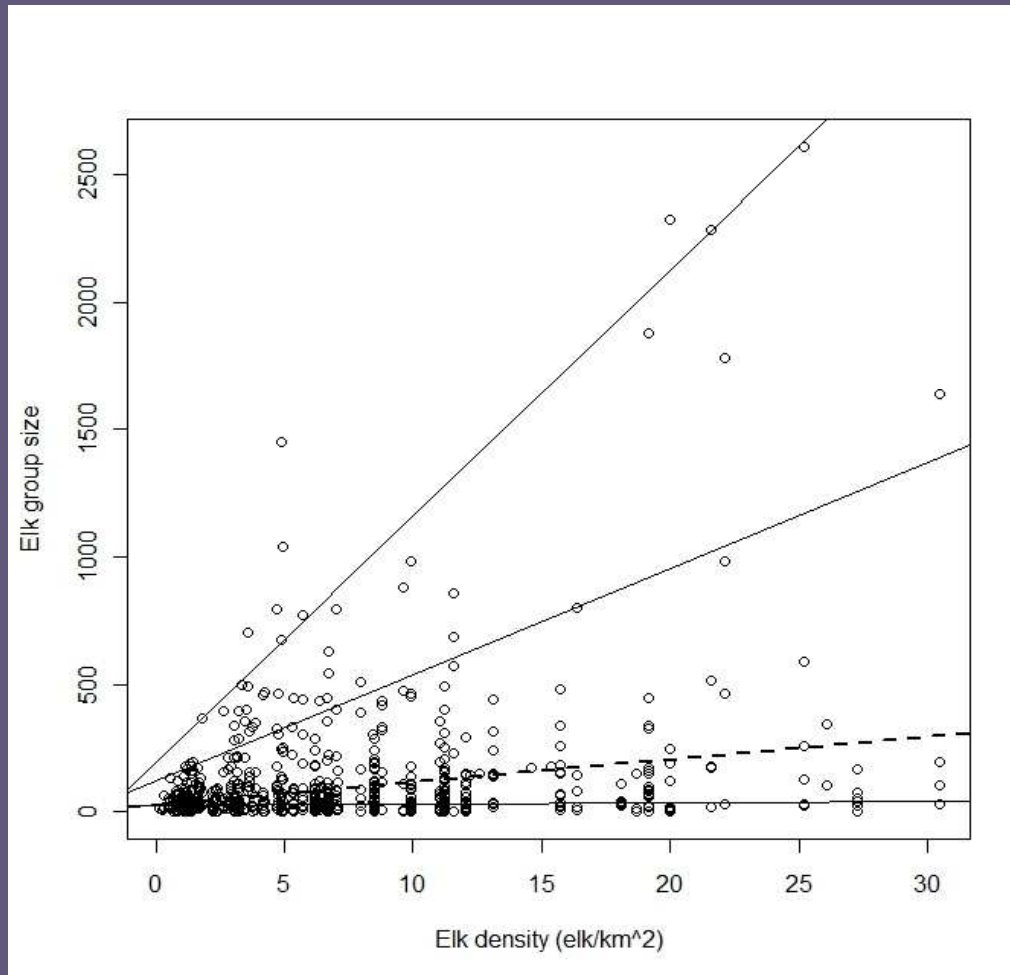


Grasslands

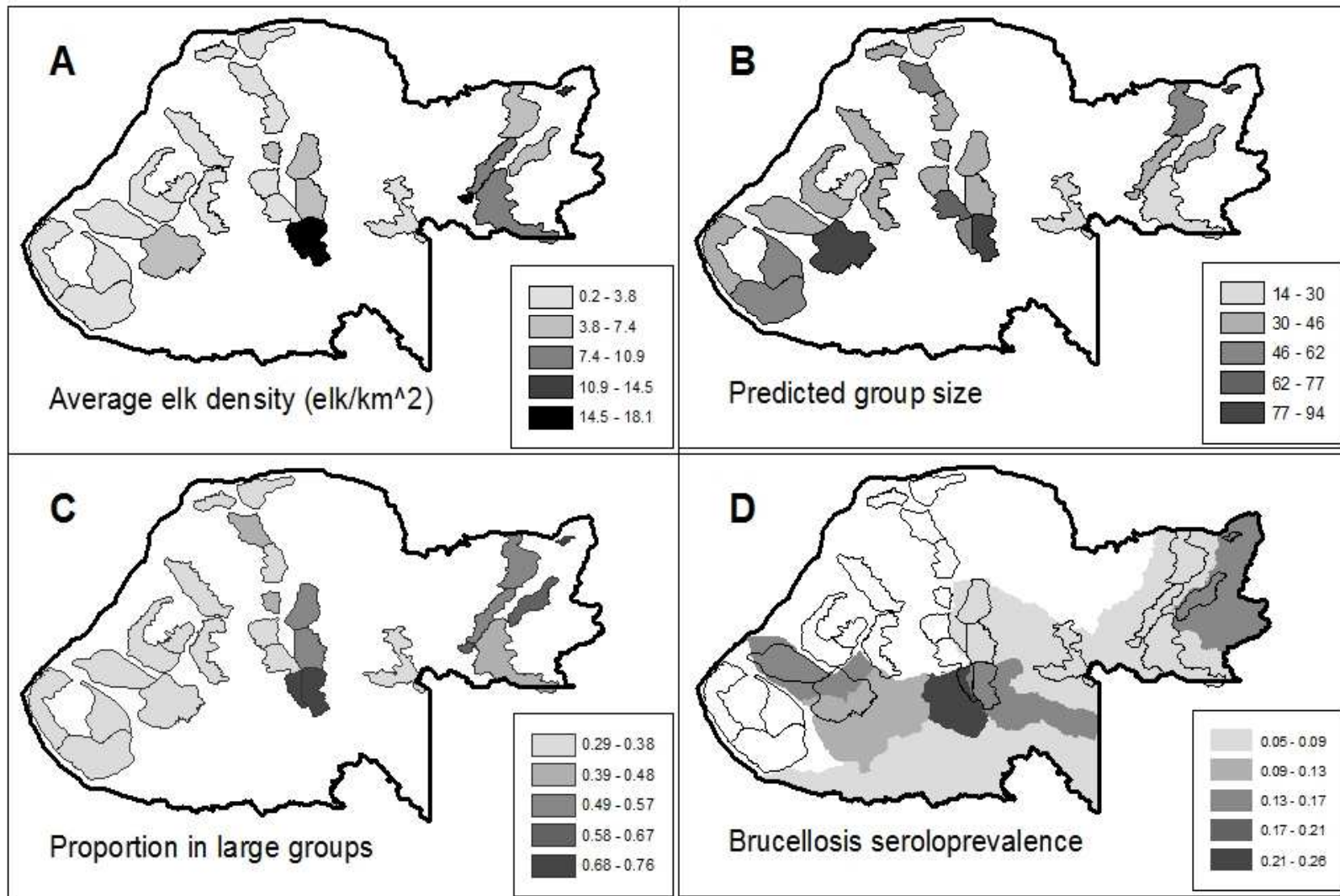


Forested areas

Elk to elk transmission risk



Elk to elk transmission risk



Elk to elk transmission risk



- MT results also suggest elk density is an important driver of elk aggregation patterns, and elk aggregation patterns may affect the risk of disease transmission.
- Management actions designed to lower disease transmission risk are not likely compatible with other elk conservation and management objectives.

Brucella environmental persistence

- Evaluate the persistence of *Brucella* on fetal tissue, soil, and vegetation
- Study conducted near the northern and western boundaries of Yellowstone Park



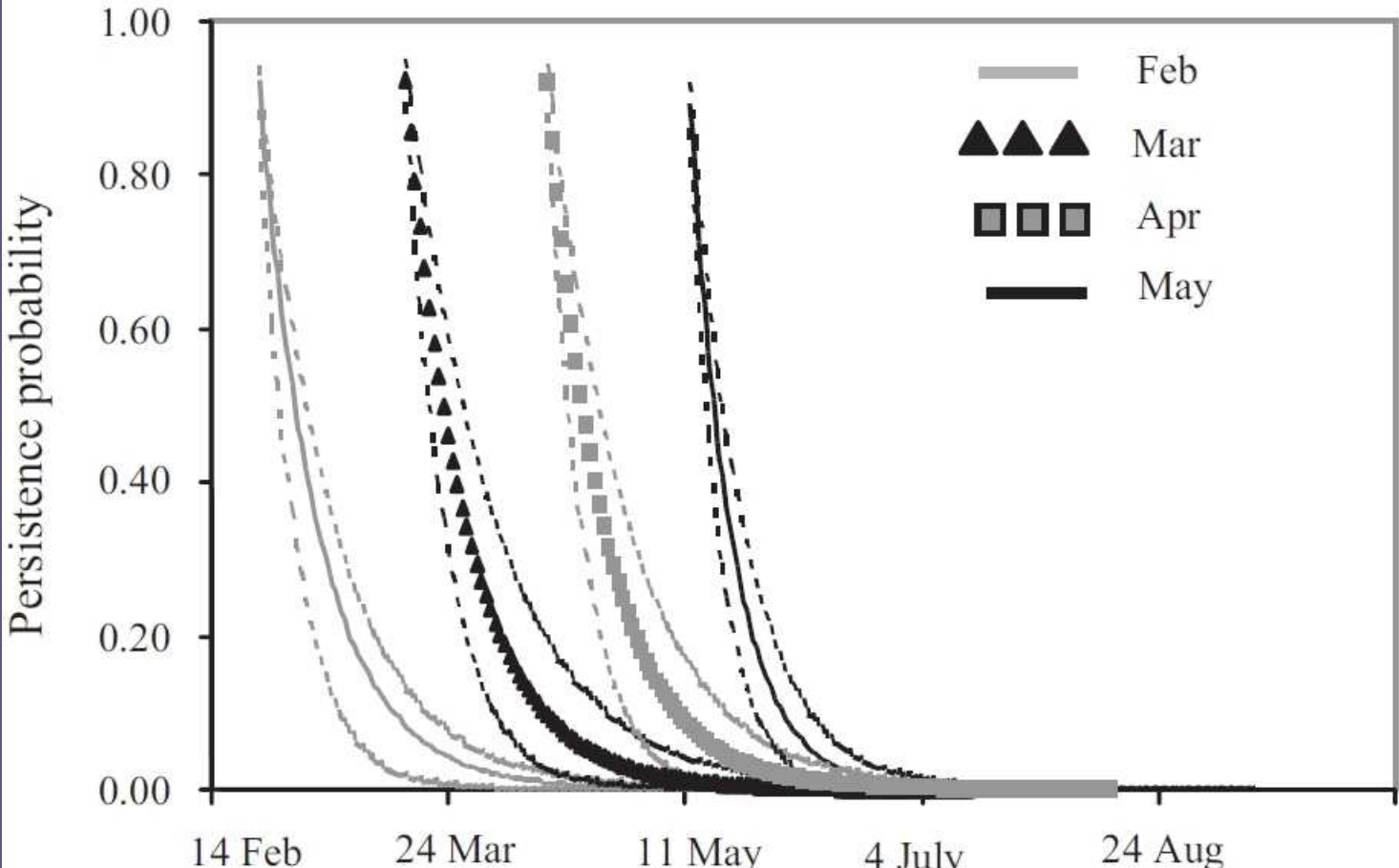
Aune, K., J. C. Rhyan, R. Russell, T. J. Roffe, and B. Corso. 2012. Environmental persistence of *Brucella abortus* in the Greater Yellowstone Area. *Journal of Wildlife Management*.

Brucella environmental persistence Results

- *Brucella* may persist 21-81 days
- Persistence depended on month and exposure to sunlight
 - Longer in Feb than May
 - Longer in shaded areas
- Scavengers played an important role in consuming infected carcasses



Results



Brucella environmental persistence

Management implications

- Provide guidance on the timing of separations between brucellosis-exposed bison and cattle necessary to manage transmission risk on shared grazing habitats
- Suggests that maintaining scavengers will enhance rapid removal of potentially infectious tissues associated with bison abortions

